Magnetic Effects of Electric Current

1. What is meant by 'magnetic field'?

The region around a magnet in which the magnetic force of attraction and repulsion is felt is called a magnetic field.

2. What are magnetic field lines?

Magnetic field lines are lines drawn in a magnetic field along which a hypothetical magnetic north pole would move if it is free to do so.

3. How is the direction of magnetic field at a point determined?

The direction of magnetic field at a point can be found by placing a small magnetic compass at that point. The north end of the compass indicates the direction of magnetic field at a point where it is placed.

4. Why does a compass needle get deflected when brought near a magnet?

The magnetic field of the magnet interacts with the magnetic field of the compass needle which itself is a small magnet. This makes the needle deflect.

5. List the properties of magnetic field lines.

i). They are closed and continuous curves.

ii). They travel from north pole to south pole outside the magnet and south pole to north pole inside the magnet.

iii). Two magnetic field lines never intersect each other.

iv). Magnetic field lines are close together where the field is stronger.

6. State right hand thumb rule.

Imagine that you are holding the current carrying conductor in your right hand such that the thumb points along the direction of current, then the wrapped fingers will give the direction of magnetic field.

7. Current flows in the clockwise direction through a circular loop. What is the direction of magnetic field at the centre of the loop?

The direction of magnetic field is into the loop perpendicular to the plane of the loop.

8. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find the magnetic field inside and outside the loop.

Inside the loop, direction of magnetic field will be downward and outside the loop it will be directed upward.

9. How will you represent uniform magnetic field in a region?
Uniform magnetic field in a region is represented by drawing parallel lines equidistant from each other.

10..What is a solenoid?
A coil of many turns of wire, wound in the shape of a cylinder is called a solenoid.

11. What is the shape of magnetic field inside a long straight current carrying solenoid?
There is uniform magnetic field inside a solenoid. Therefore, the filed lines inside it are in the form parallel, straight lines.

12. State the factors on which the strength of magnetic field inside a current carrying solenoid depend upon.
The magnetic field strength inside a solenoid depends upon the i) strength of the current ii) number of turns in the coil and iii) the nature of the core material.

13.How does a solenoid behave like a magnet?
The magnetic field in a circular loop is along its axis. When a current flows through a solenoid, the magnetic fields produced by the turns in the coil gets added up resulting in the shape of a field created by a bar magnet.

14. How can you determine the north and South Pole of a current carrying solenoid using a bar magnet?
Suspend the bar magnet freely on a string. Bring the north pole of the magnet near one end of the current carrying solenoid. If it is repelled, that end of the solenoid is north and if it is attracted that end is south pole

15. What is an electromagnet? Why is steel unsuitable as core of electromagnet?
An electromagnet is a soft iron bar placed inside a solenoid. When a current flows through the solenoid, the iron bar gets magnetized. Steel is unsuitable as the core as it changes into a permanent magnet.

16. State three uses of electromagnets.
Electromagnets are used in electric bells, telephones and electric motors.

17. State Fleming's left hand rule.
Stretch the thumb forefinger and second finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

18. When is the force experienced by a current carrying conductor placed in a magnetic field largest?

The force experienced by a current carrying conductor placed in a magnetic field is largest when the direction of current is at right angles to the magnetic field.

19. Which properties of a proton may change when it moves freely in a magnetic field?

As the proton moves in a magnetic field the direction of motion may change due to the force acting on it. This will result in a change in velocity and momentum of the proton.

20. A positively charged particle (alpha particle) projected towards west is deflected towards north by a magnetic field. What is the direction of magnetic field?

Current is towards west and the force is towards north. So, by Fleming's left hand rule magnetic field is in the upward direction.

21. State the factors on which the force acting on a current carrying conductor placed in a magnetic field depend upon.

Force acting on current carrying conductor placed in a magnetic field depends upon i) Strength of the magnetic field, ii) length of the conductor in the magnetic field and ii) the intensity of current flowing through it.

22. Define electromagnetic induction.

The phenomenon of inducing a current in a coil placed in a changing magnetic field is called electromagnetic induction.

23. State two ways to induce current in a coil.

i) Move a magnet into or out of the coil

ii) Place another coil next to it and pass an alternating current through it.

24. Name three sources of direct current.

Dry cell, solar cell and dc generator.

25. Name two sources which produce alternating current.

Bicycle dynamo and generators in the power station.

26. Name two safety measures commonly used in electric circuits and appliances.

i) Fuse ii) Earthing of metal bodies of electrical appliances.

27. What precaution should be taken to avoid overloading of domestic electric circuits?

i) Too many electrical appliances should not be operated on a single socket.

ii) Too many high power electrical appliances should not be switched on at the same time.

28. *Explain short circuit and overloading in an electric supply.*

Short circuit- When the live and neutral wire gets in direct contact with each other due to damaged insulation, it is called short circuit. During short circuit, the resistance in the circuit decreases to a very small value. This makes a very large current flow through the circuit. The wire gets heated up and may result in the outbreak of fire.

Overloading- Every electric circuit has a limit for the current that can flow through it. If too many high power appliances are switched on at the same time, the current flowing through the circuit may exceed this limit. Excess current flow will heat up the wire, resulting in fire. A fuse of proper rating will prevent fire by cutting off the current flow.

29..What is the function of an earth wire? Why is it necessary to earth metallic appliances?

Sometimes the insulation of live wire is torn and it touches the metal body of the appliance. This makes the current flow to the metal body and the user may get electric shock as the current passes through his body to the ground. An earth wire is a thick copper wire connected from the metal body to the ground. As the earth wire is a better conductor than the human body the current flows through it and protects the user from electric shock.

30. What is the difference between direct current and alternating current?

A steady current which always flows in one direction is called a direct current. A current which reverses the flow at regular intervals of time, many times in a second is called alternating current.

31. List three sources of magnetic fields

Magnets, electric current and moving charges.

32. What is the shape of magnetic field when current is passed through a straight conductor?

Magnetic field produced is in the form of concentric circles in a plane perpendicular to the direction of current.